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ABSTRACT

This paper investigates the need for electronic provision of information, and advises that the purpose and motivation for providing electronic resources be explored before embarking on a project to provide them. Many projects at universities and other institutes have been begun arbitrarily just because there happened to be financial resources available--quite often these projects lack a well-defined policy. This paper describes the Electronic Library Utrecht, a project at Utrecht University in the Netherlands. The leading principle of the Electronic Library Project is to comply with the requirements and wishes of researchers, teachers, and students. In this respect, the library project is not so much a technology-driven project as it is a user-driven project. The paper describes determining user requirements; the integration of the physical and electronic collections; searching for information independent of technical structures; an information retrieval system dependent on the type of user and usage; and the digitization of the entire library service, rather than just of the library's collection. The paper also investigates: the project organization, communication structures, and implementation of results; the realization of the projects--infrastructure and electronic library services; and practice and problems--a possible approach and reality. (SWC)

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By:

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Down to earth in cyberspace. Building an electronic library: policy, plans, practice and problems

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Keywords: electronic library, guiding policy, project management, users' requirements, information retrieval, electronic collections, infrastructures

1. Introduction

'Suppose that an ephemeron (a mayfly), hovering over a pool for its one April day of life, were capable of observing the fry of the frog in the waters below. In its aged afternoon, having seen no change upon them for such a long time, it would be little qualified to conceive that the external branchiae (gills) of these creatures were to decay, and be replaced by internal lungs, that feet were to be developed, the tail erased, and the animal then to become a denizen of the land.' Thus wrote the Scottish evolutionist Robert Chambers in 1844 (Ref 1).

As a metaphor Chambers' assertion also applies to the way we humans observe several phenomena. Yet there is an essential difference. The moment an animal dies its experience and knowledge vanishes forever, with the exception of a fraction that is transferred genetically and takes thousands of years of evolutionary adaptation to change.

We humans, though, are capable of preserving the knowledge we acquire and transferring it without the necessity to encode it genetically. The independent transference of information enables us to undergo a cultural and scientific evolution proceeding at an incomparably higher pace than any organic evolutionary process.

The provision of information through electronic networks marks in fact a revolutionary stage in history, though of course we're not busy pondering this thought all the time. Not even you and I, who as participants of this conference are daily engrossed in the problems of electronic information.

'The post-information age is about acquaintance over time: machines understanding individuals with the same degree of subtlety (or more than) we can expect from other human beings, including idiosyncrasies (like always wearing a blue-striped shirt) and totally random events, good and bad, in the unfolding narrative of our lives. [...] Like a force of nature, the digital age cannot be denied or stopped. It has four very powerful qualities that will result in its ultimate triumph: decentralising, globalising, harmonising and empowering.' Dixit Nicolas Negroponte (Ref 2).

It's quite obvious that Internet and the computer are capable of evoking a plethora of prophetic visions as to where our world is heading. Every expert and prodigy of learning is cherishing his own opinion on the matter. In the debate on the Internet two opposite camps are engaged in a fierce battle.

The first faction consists mainly of hosanna-criers who immediately get carried away by the word itself. 'It suffices to type down one term' — they preach us — 'and the whole world shall be yours on your screen.' Splendid indeed. Yet who's craving for this?

The second party — slightly less enthusiastic — are foreseeing a disastrous mental pauperisation. In the near future — they're predicting — we needn't remember anything ourselves anymore. We must only be able to locate the right home page. Before very long the structure of knowledge will be changing drastically owing to the conviction that we can safely rely on an externalised memory. Because of the hyperlinks we're going to loose the ability to follow a linear course of reasoning, thus limiting ourselves to a chaotic criss-cross way of thinking. We shall unlearn the art of deducing. Eventually, we are warned, the majority of society will consist of infosurfers, socially and emotionally handicapped beings net surfing their way through life. Beware ye all, the creation of the 'homo zapiens' is at hand.

'Down to earth in cyberspace' is the title of the present paper on the making of an electronic scientific library.

To us, builders of such a library, the Internet, computers and electronic information sources are no more than useful, perhaps very useful means that can be employed efficiently in order to improve what has always been important first and foremost: scientific education and research.

Within this context a certain reticence may prove quite recommendable. I'm afraid I therefore cannot present you with some terribly exuberant ideas.

Scientific knowledge possesses structure not because it has been documented in one way or another — on paper or in cyberspace — but because we've been giving our thoughts a structured shape. The Internet in the first place should be equivalent to access and communication, so it hasn't got much in common with the structure or the content of scientific knowledge. Stated otherwise: the meaning is *not* the message.

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2. Electronic information policy: why?

Internet, electronic information provision, multimedia; in the applications for subventions and grants they're used as magic words. But don't worry: I shall not be discussing the present reallocation of means from a traditional to an electronic provision of information. The growth of electronic collections, the disproportional rise in prices of licences for the use of electronic information, the cancelling of subscriptions to paper versions of magazines because of financial cut-downs — all this has already been discussed sufficiently at university libraries. I'd rather pose some questions that are rarely asked when we're dealing with projects concerning the electronic provision of information.

Why is this sort of electronic provision useful? Do we really need it? Who's going to use it and for what purpose? Are there any existent examples? Are all the possibilities of the medium extensively exploited or does it merely boil down to a copy of a manuscript in an electronic form? What about the quality of online files now and at sometime later? Who takes care of the quality? How is it guaranteed?

All these questions should be asked and properly answered in any project dealing with the electronic provision of information. Better even if not only the contents of an individual project were scrupulously defined but also the framework of its subsidiary projects.

It proves there are many projects at universities and other institutes that have been approached and taken up arbitrarily just because there happened to be a driving force or some financial resources as a result of 'grant chasing'. Quite often these are incoherent projects lacking a well-defined policy. In some instances there is even hardly a necessity for any project result at all. It also occurs that similar projects are executed elsewhere — sometimes at the same university. There are also projects the outcome of which vanishes forever in some desk drawer just because the project management fails to take in account the need to incorporate the results into the regular organisation.

Therefore I'd like to describe the approach of a project initiated at Utrecht University. In our view this approach contains a certain guarantee to avoid a few recurring problems and pitfalls. It is based on a coherent project organisation and has got a clear project framework from which several subsidiary projects have been derived directly.

I'd also like to say something about a number of practical problems and their solutions, as well as the human factors within the project management. Thus, a short case story.

3. The electronic library at Utrecht University: points of departure

The Electronic Library Utrecht is a project at Utrecht University, a large comprehensive university with 25,000 students, 7000 employees, 14 faculties, 19 research schools and a library collection of 4.5 million items. The project is a joint initiative of the University Library and the Academic Computer Centre Utrecht. The project was initiated in 1995, has a duration period of three years and has a total budget of £850,000. In fact it consists of 40 systematically interdependent projects. All these subsidiary projects have one common goal: the qualitative and quantitative improvement of the present provision of information, a better accessibility of information sources, and last but not least the development of a series of completely new library services.

The leading principle of the Electronic Library Project is to comply with the requirements and wishes of researchers, teachers and students. In this respect the library project is not so much a technology-driven project (based on what is technically possible) as it is a user-driven one. This implies that our users are continually involved in assessing both purpose and result.

How to take up such a series of projects? What should be its guiding ideas, its starting points? How to organise the project itself? Who is to participate in it or to contribute to it? To us all these questions had to be answered referring to the needs of the users.

3.1. Users' requirements

Yet how does one find out what wishes and needs all these users have? Just by asking them, one would suggest. However, the question of what library services they want to see realised is not very likely to yield really useful conclusions, for researchers and students simply haven't got an understanding of every alternative, nor of present and future technical solutions.

Hence the user survey at the outset of the Electronic Library project aimed at tracing the *problems* students and staff were having with the electronic provision of information. Its second purpose was to map the common *practice* of scientific research and education, i.e. how do you start preparing an article, a paper, a new series of lectures; what sources are used; and how do you search for them (Ref 3).

The results of the survey were analysed: users' requirements were derived and translated into several facilities feasible in the short and the long term, thereby taking into account the present state of technology, future standards and foreseeable developments. From the analysis have accrued a number of technologically sophisticated projects as well as some relatively simple, even trivial solutions for infrastructural problems.

The conclusions and the different project types are described in the next section. First, however, I'd like to mention our remaining points of departure.

3.2. The integration of physical and electronic collections

Suppose you were a physicist sitting at your desk. You'd like to have a look at the latest research reports on magic numbers in helium clusters. So you start up your computer and ask a database your question. It gives you a list of papers in the *Chemical Physics Letter* plus some book titles. You read the abstracts on your computer screen. One of them may be very significant and you switch to the full-text version.

Later you have another glance at the titles. One treatise looks of interest to you: it's on classical rare-gas clusters. However, the treatise is not available in an electronic form. So you switch to the library's catalogue. The book appears to be in your own library's collection. The only thing you have to do now is to order it online: within an hour the book will be right on your desk.

In many libraries this is of course still a fancy, though not for much longer. This example illustrates the thought that an electronic library isn't an isolated, virtual building in no way related to a physical collection — a collection that has been gathered, administrated and disclosed since the times of Alexandria.

Electronic and paper collections must be integrated in a complementary way. This objective implies an interconnection between primary and secondary information; between on the one hand full-text files or multimedial electronic files and on the other bibliographic sources that refer to actual books and magazines, and their physical location.

For the user this principle should bring about the possibility of looking for information on a certain subject without having to indicate in advance a source or collection. This brings us to the next principle.

3.3. Searching for information independent of technical structures

Let's first return to reality. Suppose you were engaged in medical research on spontaneously epileptic rats. Suddenly you have an urgent question, so you turn to a database containing abstracts from a magazine called *Brain Research*. You look into the next database, one that is not linked up with the first. But it appears you're not very familiar with the latter type. It takes you quite a while before you understand the system and the function of several keys and buttons. You're formulating and reformulating your question over and over again. You start searching in the catalogue. Quite desperate, finally you turn to Internet. Incidentally, you glance at your watch and breathe a deep sigh.

Can we apply information technology and all its promises, avoiding such time-consuming quests for information itself? We think so, for instance by designing an information retrieval system that enables you to browse several databases (if required) by means of one search question. This system should operate on bibliographic files as well as full-text files and other sources. It should be able to go through files marked with different indexing techniques and it's got to cope with a dynamic, physically distributed and ever-increasing collection. In short, an information retrieval system set into motion by a single entry question whilst sparing you the technical idiosyncrasies of certain databases.

3.4. An information retrieval system dependent on the type of user and usage

There are still some more general demands to be made to an information retrieval system. The system ought to operate in a tailormade way, i.e. in accordance with the needs and wishes of the user.

Suppose you were a barrister as well as your job at university. You're in a hurry because you've got to attend to a session in court in two hours. You know there is quite some jurisprudence in the case you are defending today. You also know where to find the information. But you don't want all of it and certainly not any theoretical data. You just want a specific answer to a specific question.

Suppose, after a successful session, you sense the inspiration to write a paper on the matter. In this instance you'd like to gather as much theoretical background information as possible: not only legal information but also all the relevant medical data you require. Now your wishes are of an entirely different nature to those of a few hours before.

This example suggests that an information retrieval system suiting the demands of every university staff member and student must also have a great deal of flexibility. It should be able to serve many different users who may have many varying needs.

In accordance with this the system interface should be flexible too. As a lawyer you do not wish to analyse the mechanics of the system. Nor do you feel the urge to study the inscrutable formulae in which your search question should be cast. No. You prefer the use of vernacular language using perhaps a few specific legal expressions. However, put your modest request to a forum of reference librarians and they'll overwhelm you once again with an avalanche of Boolean formulae, fascinating in their logical elegance, though quite cryptic to you.

3.5. The digitalisation of the library's own collection amounts to the digitalisation of the entire service involved

Finally the last principle. When we're discussing the building of an electronic library and the digitalisation of the library's physical collection we don't want to limit ourselves to the digitalisation of the information sources.

Even in a very modest case when we're dealing with the digitalisation of a small part of the collection, we should digitalise the library service itself. For crucial to the availability of electronic information is the adjustment of the library structure and organisation round this source. Consider for example the difference in maintenance between an electronic information source and a book or paper magazine: think for instance of the struggle against computer viruses versus moulds devouring paper books.

Less obvious, however, is the implication that library staff see their functions redefined. New skills are being demanded from them. Users will be calling on them in a different way. Consider for instance the gathering and administering of new and old material. One would expect the library organisation to apply the same quality demands to electronic information as to all other sources.

This strictness is especially significant in handling online files on the Internet. Clear agreements must be made with suppliers and manufacturers on the sources' guaranteed unfaltering quality. As a reader one wouldn't like reading an article suddenly missing a few pages that have been changed overnight.

4. Project organisation, communication structures, implementation of results

By now you may be thinking, how thoughtful to take up a project so nicely by the methodological book, neatly defining all points of departure and elaborating a long term policy. Yet, somehow and somewhere we've heard the story told before. At similar conferences we've been witnessing plenty of presentations, all of them quite impressive in their elaborate structure. So please allow us to ask, what is actually realised?

I cannot but agree with your scepticism. Nonetheless, before I answer your question, hoping to convince you by pointing out some actual results, I'll describe the guarantees built into the project organisation in order to limit the risk of failure to smallest possible degree.

First, we're dealing with a university. Utrecht University is characterised by a large degree of decentralisation. This means that every department and faculty is relatively independent. These faculties work out their own policy, not only on education and research but on automation as well.

Of course, this decentralised structure offers many advantages. The University Board can concentrate on the main management issues without being distracted by details. From a strategic point of view it can lead to quality improvement of decision-making. The departments are responsible for their own resources. Thus the resources and tasks are interconnected at a level where the consequences of the policy can best be overviewed.

For us, alas, this structure has some disadvantages. Providing facilities to research and education, this project may not easily count on a smooth acceptance and use of its results. The only method (Greek for 'way about') is the method of consensus.

Important therefore is the existence of so-called communication structures between the project organisation and the departments' managing directors and automation experts. A significant factor in this constellation are the contacts with the eventual users, the students and staff of the department. The department's board usually lends a more attentive ear to the interests and wishes of its own users than to those of managers belonging to a project that isn't part and parcel of the faculty.

Another measure to safeguard the outcome of the project is of an organisational nature. Many IT projects find their apotheosis in the approval of a thick report containing lots of recommendations, schedules and diagrams. Thereupon the report is often put into safe keeping for the next decade or so.

To avoid such an unfortunate fate the results of each subsidiary project of the Electronic Library Utrecht are implemented in the regular organisation and its branches. This implementation is conducted in the last stage of each project. The altered tasks of library staff and Academic Computing Centre personnel with respect to the new services are first described and then introduced at each department. Obviously, this is not possible without the unconditional support of the university librarian and the managing director of the computing centre. To that purpose both directors have been appointed as supervisors of the project and of the implementation of results in the steering group.

5. The realisation of the projects

What is actually being realised? What is the content, the body of the projects? Do they really comply with the guiding principles?

I've already mentioned the point that the user surveys, in which *problems* were assessed and analysed, provided a guiding factor in the definition of our projects. One can easily guess that a larger part of these problems was connected with the infrastructure and the support during information searches. The first series of subsidiary projects is dealing with the infrastructure in its most comprehensive meaning.

The same user surveys were used to analyse the *wishes* of students and staff as to library services. In addition the project management of course took into account a broad range of technical facilities, new standards and trends. These requirements, now in specified form, have led to a second series of projects, i.e. the new electronic library services.

5.1. Project series 'Infrastructure'

One of the most astonishing conclusions of the user surveys and panel debates conducted amongst users in Utrecht and at universities abroad was the assessment of a stark need for (electronic) information sources, whereas at the same time — and this is the astonishing fact — hardly anyone knew of the availability of already existing facilities. If someone did know he wouldn't consider using them.

Why? one is tempted to ask. The simple answer is that all these information sources aren't accessible when

you are sitting at your own desk. Students and staff have to go to the main library building where they are welcomed by a computer screen in some dark corner, showing an eery interface with grinning codes. Even for people with steel nerves this proves too much. The timid scholar seeks safety with a library employee who appears to be extremely busy. So in the end he runs off back to his refuge. And there he's at his desk again patiently waiting for the information in print they've promised to send him by the end of the week — the same information he could easily have had on his own computer screen within a few seconds.

Lately, the price of information has been increasing sharply: not only in an absolute sense but also in comparison with the frequency it has been used, as is the case with electronic information. A peculiar situation, for more information is being offered (at a steadily growing price) whereas users tend to neglect it. Yet this regrettable — some would say unacceptable — fact is a general phenomenon at many universities and institutions.

The solution is self-evident: better information, guidance and instructions on the availability of electronic information sources and its facilities, improved ergonomic interfaces, an efficient information retrieval system, the additional training of library personnel and an uncomplicated access to all information sources. These objectives are being realised in subsidiary projects. Each of these projects has a guideline defining its substance in accordance with the leading principles of the project's framework.

On the one hand the projects aim at solving existing problems. On the other hand these solutions must be characterised by definite durability, taking into account the dynamic developments in the field, for example an ever increasing collection, changes introduced by information suppliers who tend to offer more and more platform-independent sources (like SilverPlatter), the expansion and improvement of users' equipment, the library's independent managing and maintaining of electronic information sources — several professional consequences for the library staff.

In the section after the next I hope to give you an idea of these kind of problems and solutions in practice.

5.2. Project series 'Electronic Library Services'

The leading principles for this series of projects were also derived from the user surveys. In this instance we've concentrated on the wishes expressed. The projects include:

- the digitalisation of traditional services:
  - the filtering of information and electronic notifying services (SDI);
  - the electronic availability of the books' table of contents;
- the digitalisation of the library's own collection: the (partial) digitalisation of special collections, old prints, impressions and manuscripts;
- the digitalisation of the university's scientific output: electronic publishing of theses, papers and articles.

In this case we also keep ourselves to a number of guidelines. For instance a digital information source ought not be a mere electronic copy of a paper one. Besides linear scrolling it should be possible to indicate a desired topic. Apart from text, pictures and statistics, one would like to include moving images (films) and sound. Separate documents should be hyperlinked to related material within the library's own collection and beyond, but also indicating bibliographical sources and the location of printed material.

These projects are not only to result in the digitalisation of material but also in a methodology for similar activities and decisions regarding the remaining parts of the collection.

It goes without saying that the outcome of the projects is useful for others owing to their interdependence and coherence in a larger framework. An example of this is information-retrieval projects.

As I've already mentioned, the (partial) digitalisation of the collection as a matter of fact amounts to the digitalisation of the entire library service or the revision of the library organisation. One cannot simply reduce the latter by describing it as an adjustment or expansion of library and IT-staff adorned with some extra technical training courses.

Especially in the case of projects on electronic publishing, there is usually a lack of organisational tactics and guidance provided in the traditional information chain. This chain is now imploding because separate functions are being intertwined, thus becoming indistinguishable from each other (Ref 4). The author is no longer different from a publisher. Moreover, this is linked with all kinds of copyright problems. It's only fair to admit that in Holland not all the legal bickering over electronic publishing and copyright has been completely solved yet. This is partly due to insufficient jurisprudence.

The lack of useful examples makes it necessary to adjust the library organisation through the complicated method of trial and error. And now for some troubles and traps, and their clearing away something on a particular project that has been quite enlightening in this respect.

6. Practice and problems

One of the most awkward and enduring problems proved to be the access to information sources from every place on the campus. In part this problem was also the reason for the poor usage of electronic information sources.

A short case story:

6.1. A possible approach: which scenario and which considerations?

Our objective is clear: to endeavour towards an accessible electronic library from every working site or desk on the campus inspired by the fierce wishes of students and staff members. But how to reach this goal?

In preparing our pursuit we first had to answer two questions: how is the barometer, the 'market situation' for electronic information sources? Second, how's the terrain, the infrastructure at Utrecht University?

The subscriptions, i.e. the licences we have (about 60 databases in all) can be technically divided into two types: platform-*dependent* (CD-ROMs for DOS, Windows, Apple Macintosh or Unix) versus platform-*independent* sources (predominantly online databanks) accessible through World Wide Web browsers or Gopher.

Presently most information sources offered by publishers are platform-dependent ones accessible only via DOS. These sources constitute about 90% of the total amount of sources available at Utrecht University: quite a lot.

However, this needn't be a problem if you realise that 80% of all PCs are DOS-machines. Another fortunate circumstance is the comparative modesty of the required hardware. Simple Intel 386-type machines, purchased some five years ago which nowadays are mainly used as wordprocessors, are still suited for receiving electronic information.

Why not connect those faithful old boxes to the information sources on the network? Why, you're then asking yourselves, wasn't this done before? Why did you have to arrange some special project to this end?

The answer is baffling in its banality: because of conflicting network software. The larger part of our electronic information sources are accessible exclusively via the so-called NFS protocol. Most faculties however use Novell, a protocol that cannot communicate with NFS. This means the use of platform-dependent sources is also limited by the type of network to which the computer is connected, this contrary to platform-independent sources.

How to solve this problem? There are several scenarios.

The first one looks very simple. You do nothing: you flatly refuse to spend a single penny on it. For the time being these electronic services will only be available on specially equipped computers. One just has to wait until all information providers are offering their products in a platform-independent manner, i.e. via the World Wide Web.

There is a slight 'but' to this. By then as a user you'll need quite a powerful computer, the latest high-end machine equipped with a top-notch processor and lots of RAM. If your department cannot afford to buy such a machine, well, bad luck for you. Perhaps in some distant future there'll be higher spending budgets instead of the common annual cuts.

The second scenario is less coarse. You concentrate yourself on configurations meeting the demands of predominant information sources (in our case DOS), taking into account the number of these machines in comparison with the total amount of computers (i.e. 80%). Then you start plodding, trying to rub out the incompatibility problem between the network protocols.

In addition one can try and realise a platform-independent access for the few happy owners of powerful computers, assuming that their number is growing steadily.

We chose the latter option and met with some difficulties: problems we were able to overcome.

6.2. Reality

Erasing the incompatibility between network protocols appeared to be a much tougher ride than we had anticipated. It wasn't a trifle: we couldn't just bridge the gap by means of some kind of ready-made translation program, taking us only a week to build.

To be honest, the project took us nine months. I shan't bore you with our misery — all those wrong and outdated test keys, false network addresses etc. — I'd only like to mention one significant and recurring problem.

We always tend to forget *la condition humaine*, the human factor. It never is a matter of mechanics only. Conflicting views, opposing proposals and alternative solutions — the stuff debates are made of, the gist of many a time-consuming discussion.

IT experts usually don't express much enthusiasm at the thought of a platform-dependent access to an electronic library. 'Why do we have to work on an obsolete solution? We've got the knowledge, gentlemen, the technology to realise a state-of-the-art option.'

Library staff knowing the wishes and needs of most users by contrast take a different stance. They dread experiments with software, fast machines and the like, not interested as they are in promising technical innovations. 'It also works the good old-fashioned way. So why bother?'

The faculties are the third party in the game. In the least irksome case they're compelled to discuss all kinds of tailor-made solutions interminably with their IT-departments.

All in all this doesn't enhance the progress of a project. But eventually, after nine months of patience we reached our goal.

Patience is the key-word for *problems*. The key-word for *solutions*, though, is perseverance. One must never forget the purpose of the project: to comply with the needs of the library's users, i.e. students, teachers and researchers. Very helpful in this respect is the idea of — let me borrow an American expression here — a 'user-centred library'. Most IT experts object to this. Here a different phrase would be better, they say: for instance 'your future research needs are our present concern.'

But we need not polemicise on this. As the above paragraphs prove we're trying hard to realise both objectives.

In this paper I've attempted to outline the framework in which the Electronic Library Utrecht projects are

embedded, plus their governing principles. I've mentioned the example of a complex project to illustrate that this approach offers a guarantee to quite successful results.

We don't reject any utopian visions of information technology — they simply aren't our first preoccupation. We've chosen to give our project's foundations sound and solid ground — just down to earth.

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